

CITY OF LOS ANGELES



MANAGEMENT AUDIT

of the

BUREAU OF ENGINEERING

Department of Public Works

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Keith Comrie
City Administrative OfficerReleased
August, 1982

CITY OF LOS ANGELES

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August 20, 1982

The Honorable Tom Bradley
Mayor of the City of Los Angeles

The Honorable Council of the
City of Los Angeles

Transmitted herewith is the Report of the Management Audit of the Bureau of Engineering, Department of Public Works. This Report was initiated in the normal course of events consistent with the Charter authority of the City Administrative Officer.

Upon our undertaking of this Audit, several Councilpersons made known their concerns regarding the performance of the Bureau of Engineering; these concerns centered around the length of time required by the Bureau to design and construct a public improvement project, once a project had been financed. Our Audit has centered on this problem. In the period from 1971 to 1980, the average time to complete a capital improvement project has increased from 37.1 months to 55.0 months. Further, many projects first financed twelve, eleven, and ten years ago have not yet been completed.

There are several factors which influence this performance record which are beyond the control of the Bureau - primarily, environmental considerations required by State and Federal legislation, and Federal Aid Urban (FAU) processing requirements. However, the Audit concludes that the greatest contributing factor is the lack of effective, systematic project management. The following deficiencies are evidence of the absence of project management:

- *No organizational unit or individual below top management is responsible for following a project from inception to completion.
- *There is no Bureau-wide scheduling system. Each design group determines its own schedule.
- *There is no dependable system for reporting project status or future scheduled performance.

*There is no accountability for project performance in relation to schedule or costs.

The Audit contains a recommendation for establishment of a project management system designed to correct the above deficiencies and others. In fact, the Audit Report concludes that an effective project management system will have a favorable effect on almost all the issues identified. It is encouraging that the Acting City Engineer and the Board of Public Works are in agreement with us on the importance of project management. The Bureau plans to implement a system which will have most, but not all, of the elements which we recommended be included in the ideal system.

Although we cannot now estimate the impact of this recommendation in terms of the reduction in project processing time, we do estimate that the effect will be substantial and should be evident within one year from implementation.

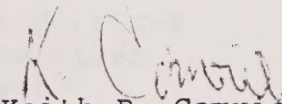
The primary audit activity associated with this Report occurred during the 1981 calendar year and its release has been delayed for various reasons, including a substantial staff commitment to Council support in connection with the exhaustive review of the 1981 Management Audit of the Police Department. In the intervening period of time, the management of the Bureau has implemented many of the recommendations contained herein.

We are pleased to report the full concurrence of the Board of Public Works Commissioners, the Acting City Engineer and this Office in the findings and recommendations of this Report.

The City Engineer is requested to submit a report to this Office within six months detailing progress achieved in implementing the recommendations.

The Management Audit of the Bureau of Engineering was supervised under my direction by John Coombs, Assistant City Administrative Officer, and Al M. Beuerlein, Chief Administrative Analyst. Members of the Audit Team were Robert J. Arata, Lambertus H. Becker, John J. Harris, Luther H. Johnson and Daniel J. O'Connor.

Very truly yours,




Keith B. Comrie

City Administrative Officer

KC:LHJ:ph

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INTRODUCTION

This is the third management audit of the Bureau of Engineering. The last audit was conducted in 1977. Since 1977, as the result of the realignment of Public Works functions, the Bureau has assumed the following additional responsibilities: spread and collection of assessments, design and construction supervision of public buildings and yards, and acquisition of rights of way.

The Bureau of Engineering is one of seven bureaus in the Department of Public Works and is headed by the City Engineer who, by Charter, is an officer of the City. He is appointed by the Board of Public Works in accordance with civil service provisions of the Charter.

The Bureau designs and prepares the construction drawings, estimates and specifications for all streets, bridges, sanitary facilities, storm drains, and related public improvements, and subsequently handles contract documents and certain contractual relationships during construction and provides construction engineering services. It is responsible for the engineering features of all subdivisions, land acquisitions, and related activities, together with the basic Assessment Act procedures involved in public improvements financed by that method. This Bureau spreads the cost of special assessments processed by the City in accordance with State laws and City improvement and maintenance ordinances; collects, accounts for, and distributes monies paid to the City for improvement and maintenance assessments; maintains basic records of special assessment liens on real properties and final dispositions thereof; and provides assessment advisory service to the City Council and its Public Works Committee.

The Bureau is charged with the responsibility for all basic and project surveying and the preparation of all basic maps, and is the custodian of all related engineering records. It is also custodian of all original maps, plans, records, and other data related to the public works with which the Bureau is concerned. It acts as coordinator with Federal, State, and County agencies in matters pertaining to the financing, design and construction of public works facilities.

The Bureau also prepares plans and specifications for municipal facilities projects; prepares preliminary designs for new buildings and supervises plans prepared by private

architects; checks plans and prepares structural, electrical and mechanical engineering details; prepares construction cost estimates; and provides construction contract management and construction supervision.

The Bureau acquires rights of way and easements required for City streets, sewers, storm drains, and other similar uses; purchases properties required for use by City departments; negotiates and administers short-term rentals of property acquired by the City for public purposes; sells City-owned properties which are not being used; and in furtherance of these functions appraises properties, examines titles and processes title transfers.

The Bureau's 1981-82 Budget provided for direct appropriations of \$29,685,567 and directly related costs of approximately \$9,454,992, for a total of \$39,140,559. For 1982-83, there are 1,068 position authorities in the Bureau.

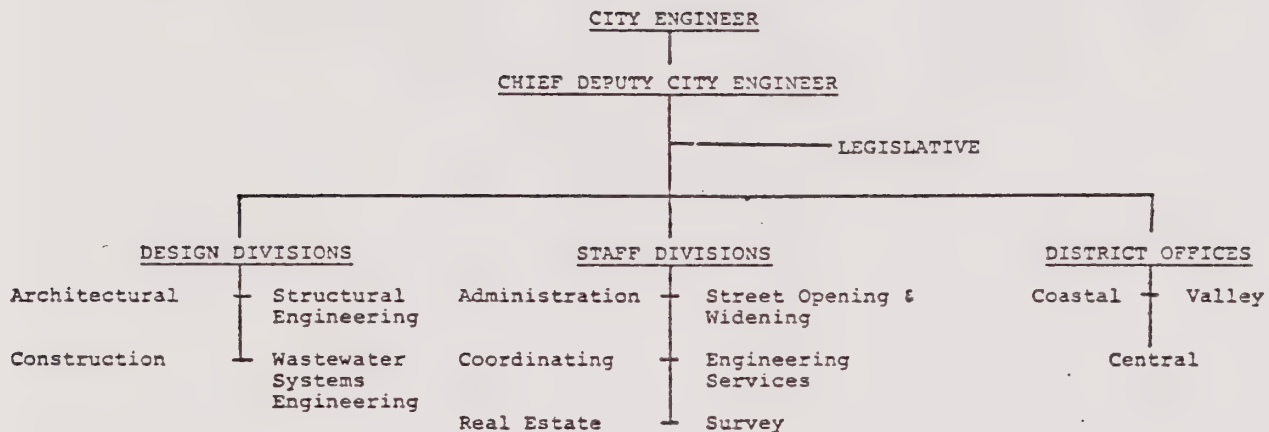
During the course of the audit, members of the Audit Team interviewed numerous employees of the Bureau in downtown and district offices. Their cooperation and assistance is appreciated. Other governmental jurisdictions and City departments, as well as a large private engineering firm, were also contacted.

We have reviewed the findings and recommendations of the Audit with members of the Board of Public Works, the Acting City Engineer and the Director, Bureau of Sanitation. We are pleased to acknowledge full concurrence, and to report that many of the recommendations either have been implemented or are underway.

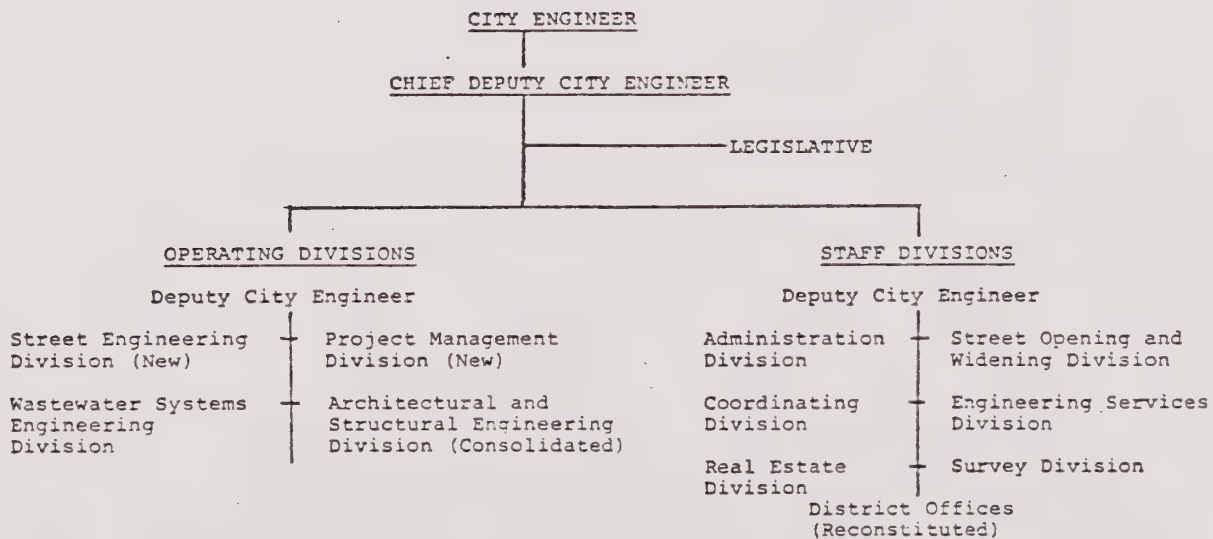
ORGANIZATION CHART

DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

PRESENT



PROPOSED



SUMMARY OF FINDINGS

The Bureau of Engineering, though staffed with many dedicated and capable employees, was not effectively fulfilling its basic responsibility of timely production engineering at the time of the Audit. Public improvements required far too much time to complete. Our review indicated the average length of time required to complete an improvement project in 1980 was 55 months as compared with 37 months in 1971. This increase may be attributed in part to causes beyond the Bureau's control, but any delay in the completion of projects is costly to the City, and assertive management action is required to reduce the development timeframe of projects. Recent steps taken by Bureau and Department management indicate recognition of this need and a willingness to address it responsibly.

The reasons for project delay in the Bureau are numerous, and, because of their interrelationships, complex. It is possible to identify several apparently dominant factors, however, including:

- a) Bureau independence in project planning;
- b) Insufficient attention to project management;
- c) Inaccurate workload assessment;
- d) Decentralized design services; and
- e) Increased procedural requirements imposed by other levels of government, and grantor and regulatory agencies.

A summation of the Audit's findings with respect to each of these factors follows.

a) Bureau Independence in Project Planning

Historically, and with but few exceptions, the Bureau of Engineering assumed responsibility for the initiation and conceptual planning for the physical plant portion of the City's Capital Improvement Expenditure Program (CIEP). As a result, the Bureau has been in a uniquely controlling position with respect to the complete lifecycle of project development, design and construction. The key exceptions are the Bureau of Street Lighting, which has the lead role on street lighting projects, and the

Department of Transportation, which has been assigned this responsibility for street improvement projects. The Bureau of Engineering, however, has retained independence with respect to a number of important elements of the CIEP, including sewage treatment facilities, storm drains and sewers. The Bureau of Sanitation, which must subsequently operate and maintain these facilities, has played only a limited role in project development. However, in relation to sanitary landfill projects and to Bureau yards and shops, the Bureau of Sanitation plans and initiates all projects.

There is a need for the Board of Public Works to define and formally establish a project initiation, review and planning methodology for CIEP projects which insures the substantive participation of operating agencies. In this way, the present team approach to the development of projects may be sustained in the future.

b) Insufficient Attention to Project Management

At the time of the Audit, capital project responsibility was diffused among many individuals and units, and project control was largely ineffective. Although recent actions by both the Board of Public Works Commissioners and Bureau management indicate strong movement toward increased project management, this long-term need in the Bureau, characterized by the lack of continuous focused responsibility for project completion, is a major concern.

c) Inaccurate Workload Assessment

Bureau management has not used its resources to advantage; has not adequately related workload to staffing requirements; and has not conducted sufficient workload analysis. Workload assessment efforts have been hampered by the continued inclusion of projects in the Bureau's active backlog which cannot be completed, for various reasons, within a reasonable timeframe.

d) Decentralized Design Services

For many years while the physical growth of Los Angeles was substantial, especially in outlying areas, it proved beneficial to both the City and developers/contractors to locate engineering design services in district offices throughout the City in close

proximity to the scene of development. This case can no longer be validly made. Physical development of the City street system has dramatically slowed, and future emphasis appears certain to be placed on maintenance of existing facilities while requiring developers to provide necessary street improvements as a condition of future development. Decentralized design services can no longer be justified when weighed against the need to establish City-wide design priorities, improve the utilization of design staff, and clearly focus project design responsibility.

e) Increased Procedural Requirements

In recent years, Bureau productivity has been severely impacted by the imposition of an impressive list of detailed procedural requirements by both Federal and state governments through a variety of grantor and regulatory agencies. The cumulative effect of these requirements has significantly delayed and complicated the City's Capital Improvement Program. Although the ability of the Bureau to address such requirements can be improved as a result of formalizing and emphasizing project management, it is unlikely that such efforts will completely counter the impact of this factor.

Historical fluctuation in the magnitude of the Capital Improvement Expenditure Program, and a general downtrend in the level of Bureau staffing (except for the period 1979-81 when staffing increased as a result of Public Works consolidations), strongly suggest the need to establish a design staff nucleus to perform the majority of the design work approved by the City. Consistent with this approach, increased consideration should be given to the use of private contractors for design work beyond the capability of the Bureau's stabilized workforce.

Any changes in organization and/or staffing level resulting from the implementation of this Audit Report's recommendations should be accomplished through normal attrition.

RECOMMENDATIONS

(Note: Recommendations preceded by an asterisk are policy recommendations requiring action on the part of the Mayor and City Council.)

A. That the Mayor and Council:

- * 1. Instruct the Board of Public Works, the Superintendent of Building and the Director of Planning to form centralized permit processing centers at the West Los Angeles and Harbor areas, by relocating public counter personnel of the Bureau of Engineering and the Planning Department to the facilities now occupied by the Department of Building and Safety at those locations. Further, instruct said heads of departments to participate cooperatively in a thorough study of the relative advantages and disadvantages of forming such a center in Van Nuys. (See pp. 20-25.)
- * 2. Increase from \$25,000 to \$75,000 or 25 percent of the proposed contract amount, whichever is less, the City Administrative Officer's authority for transferring funds from the contingency accounts of the Capital Improvement Expenditure Program to approved projects for the purposes of (1) awarding a contract, (2) completing a contract requiring additional funds because of unforeseen change orders which do not alter the approved scope of the project, or (3) completing an acquisition. (See pp. 39-40.)

B. That the Board of Public Works:

- 3. For the purpose of clarifying responsibilities in regard to the City's Capital Improvement Program, instruct the City Engineer to prepare for Board approval a policy directive which ensures that:
 - a. The General Manager, Department of Transportation, and the Director, Bureau of Street Maintenance, will be provided full opportunity to participate in the planning and initiation of improvement projects involving footbridges and landscaping streets and highways.
 - b. The Director, Bureau of Sanitation, will be provided full opportunity to participate in the

initiation and conceptual planning of future sanitation improvement projects relating to storm drains, sewers and wastewater treatment plants.

(See pp. 14-17).

4. Instruct the City Engineer to:

- a. Centralize the design activities of the district offices into the Civic Center area utilizing a phased approach over a two-year period.
- b. Reorganize the Bureau to bring the entire design effort under the direction of one Deputy City Engineer at such time that Recommendation 4a. above has been accomplished.
- c. Upon completion of a. and b. above, or concurrently therewith, eliminate through attrition one of the three existing positions of Deputy City Engineer.

(See pp. 18-20.)

5. Take the following actions to improve the efficiency of district operations:

- a. Instruct the City Engineer to close the West Valley District Office entirely and transfer all activities, excluding design, to the East Valley District Office, and to transfer design activities to the Civic Center in accordance with Recommendation 4a.
- b. Instruct the City Engineer to retain public counter services and private development processing activities and personnel at both West Los Angeles and Harbor District Offices following the centralization of the design activity.
- c. Instruct the City Engineer to retain mapping maintenance activities and personnel at the East Valley, West Los Angeles and Harbor District Offices pending completion of the transition to the Automated Mapping Program, at which time the need for mapping maintenance personnel in the district offices should be reevaluated by Bureau and Department management.

(See pp. 20-25.)

6. Instruct the City Engineer to take all necessary steps to consolidate the existing Architectural Division and the existing Structural Engineering Division into a single organization, within a timeframe which acknowledges personnel management considerations. (See pp. 25-26.)
7. Instruct the City Engineer to devise a centrally-controlled, Bureau-wide priority system for the orderly and expeditious completion of projects, using as guides the priorities assigned to a project by the requesting agency and the availability of funds or the potential of the project for future funding. (See pp. 30-31.)
8. Modify its policy regarding the approval of construction contract change orders by delegating to the City Engineer authority to approve change orders up to \$25,000, not to exceed 25 percent of a contract. (See pp. 40-41.)
9. In conjunction with the City Attorney, develop and implement a notification procedure for the Board with respect to the transmission of contract documents to the bidder. Further, that the Board of Public Works monitor the bidder's progress in submitting the completed documents to the City Attorney. (A cooperative effort should be made to execute contracts within 30 days with stricter enforcement of the Charter provision by the Board of Public Works.) (See pp. 41-42.)
10. As a logical extension of the recently formed project control unit, instruct the City Engineer to establish a project management division to be initially staffed from existing personnel resources, and assign to the division authority and responsibilities as outlined in this Report. (See pp. 43-47.)
11. Instruct the City Engineer and the Chief Accountant, Bureau of Accounting, to take action as required to make the Cost Accounting System compatible with the Project Status Report and History of Projects File so that:
 - a. Design costs and other Bureau costs can be retained for each project.
 - b. Project design-cost-to-construction-cost ratios can be further developed for the different project

types to provide a better basis for establishing resource requirements for future projects. These resource requirements would use historically established design-cost-to-construction-cost ratios and other professionally accepted indices to predict the requirements for new projects.

- c. Continuous financial monitoring of each project can be maintained to identify emerging problems, and provide insights into the development of projects purely from a cost perspective so that cost overruns are avoided.

(See pp. 47-49.)

12. Instruct the City Engineer to:

- a. Conduct a pilot study based on requiring private contractors to provide their own construction surveying on selected projects.
- b. Analyze the results of the pilot study and transmit appropriate findings and recommendations to the Board for consideration.

(See pp. 52-54.)

13. Instruct the City Engineer to exercise his option to selectively request bids for the complete design and construction of future major projects, consistent with specific definitions and criteria to be developed cooperatively with the respective operating agencies (departments) of City government. Where appropriate, "turnkey" type contracts (design and construction by the same contractor) should be used. Any staff freed as a result of this recommendation should be reassigned and their vacated positions eliminated. (See pp. 54-55.)

C. That Bureau of Engineering management:

14. Review all of the general engineering work orders and:

- a. Delete all obsolete work orders, and submit a listing of all such work orders, together with those identified in b. below as "inactive", to the Board of Public Works and the City Administrative Officer for review and concurrence.
- b. Divide the remaining viable work orders into active (those to be worked on in the current fiscal year) and inactive categories.

- c. Remove all inactive work orders from resource or budget consideration and prohibit any expenditure of resources on them.
- d. Through periodic (quarterly) review of the cost accounting records, hold the District or Division Engineer responsible for making sure that inactive work orders do not utilize Bureau resources without management or Board authorization.
- e. Identify, using the current year adopted budget as a base, the expected level of resources available to perform the work (active work orders) assigned to the Bureau.
- f. Identify the resources that will be available for design activities by subtracting resources required for public counter services (B permit, parcel maps, etc.) and contingency design services.
- g. Relate design resources to projects and eliminate from the annual work program those projects to which no resources can be assigned.
- h. Do not approve interim projects unless resources are made available by Mayor and Council to complete them.

(See pp. 27-30.)

15. For all active projects:

- a. Develop an up-to-date Project Status Report to be kept current through monthly revision.
- b. Utilizing the History of Projects File, develop mean expected time frames for completing different project types: assessments, street improvement, CIP, storm drain, combination, etc. Utilize this information in the development of a critical path network for all project types and incorporate critical decision and action points into the Project Status Report. Develop an exception reporting system for the Project Status Report to identify the projects approaching action decision points for management status review.
- c. Develop staffing patterns derived from cost ratios and professional expertise.

- d. Establish expected completion or accomplishment dates for each critical decision or action point.
- e. Identify the resources required to progress through the network and assign resources to the network segments in accordance with management priorities for expediting completion.
- f. Have the District or Division Engineer review project progress on a monthly basis, with Bureau management review at each major decision or action point identified in the Project Status Report.
- g. Conduct a yearly management review of each active project which varies \pm 10 percent or more in time or resources to determine the degree to which project progress approximated the program expectations and document in the Project Status Report any causes for deviation.
- h. Provide the Mayor, Council and City Administrative Officer with a list of engineering projects and the schedule for their accomplishment for each new budget year. Further, at the conclusion of the budget year, provide the Mayor, Council, and CAO with a report comparing project progress (performance and budget) with the original program projections.

(See pp. 31-36.)

- 16. Determine the number of engineering positions required to establish a staff nucleus for Bureau design operations. This staffing base should be fixed at a level below that which can be specifically justified by the annual workload, with the balance and any additional work to be accomplished utilizing private contractors. (Note: The differential between the base staffing level and the level justified by actual workload should be determined by Bureau management, considering as a significant variable the low end of an estimated range of funding for physical plant improvements.)

(See pp. 51-52.)

- 17. With a view to improving efficiency and standardization of procedures:

- a. Reevaluate the magnitude, scope and content of the Bureau of Engineering manuals as originally planned, and develop a revised plan for their timely completion, and for procedures to systematically update the manuals on a current basis.
- b. Assign one or more staff members with a detailed working knowledge of the private development process to work full-time to complete the Part D, Subdivision and Dedications Manual.

(See pp. 56-57.)

FINDINGS

I. Bureau Independence in Project Planning

The Department of Public Works is responsible for the design and construction of all public works projects of the City, with the exception of those projects undertaken by the proprietary departments and the Department of Recreation and Parks. The role of the Bureau of Engineering in this process has been changing and is in need of further clarification.

Issue

The Bureau of Engineering functions as its own sponsor on wastewater facilities and storm drain projects. It determines the need for projects, initiates them, identifies financing sources and prepares conceptual plans. The Bureau of Sanitation, which has operating responsibility for these facilities, has been a limited participant in these important activities, and exerts no influence over project accomplishment.

Further, the Department of Transportation and the Bureau of Street Maintenance have not participated to any significant degree in the planning and initiation of projects in which they may have direct and legitimate interest, for example, footbridges or landscaping projects for streets and highways.

Discussion

The City Charter contains no reference to the Bureau of Engineering; the Bureau came into being as a result of the appropriation of funds for that purpose in an annual budget. However, Charter Section 49 specifies the duties of the City Engineer:

...He shall perform such civil engineering and surveying necessary in the prosecution of public work done under the direction or supervision of the board (of Public Works) as the said board may require. He shall make such certificates and reports upon the progress of such work, and shall make such surveys, inspections and estimates, and perform such other surveying or engineering work as may be required by said board or by the Council...

He shall have all the powers and perform all the duties imposed upon him by this charter, the

ordinances of the City, the general laws of the State and the orders of the Board of Public Works, and shall be the custodian of and responsible for all maps, plans, profiles, field notes and other records and memoranda belonging to the City pertaining to his office and the work thereof, all of which he shall keep in proper order and condition, with full index thereof...

Historically, the above provisions were interpreted and applied broadly to increase the scope and authority of the Bureau of Engineering. The Bureau has performed the functions of facilities planning, conceptual design, engineering design, and construction engineering supervision for almost all those projects described as "physical plant projects", including streets and highways, landscaping on streets and highways, footbridges, storm drains, sewers, and wastewater treatment facilities. The physical plant projects not controlled by the Bureau included street lighting projects (originally assigned to a Department of Street Lighting, now the Bureau of Street Lighting) and traffic control projects (assigned to a Traffic Engineering Department, later Traffic Department, now Transportation Department). Thus, in this evolutionary fashion the City Engineer became the official responsible for planning and initiating most public improvement projects involving the City's physical plant, although the City Engineer has no operating responsibility for any portion of that physical plant.

In 1954, the Capital Improvement Expenditure Program was formalized by ordinance (now Administrative Code Section 5.44) as the vehicle for requesting, approving, and financing of capital projects. The Code section provides that "Each department and officer concerned shall compile annually...a list of capital improvement projects...which, in their opinion, are necessary to carry out their duties and responsibilities under the City Charter and ordinances of the City..." Again, this provision has been widely interpreted to mean the Bureau of Engineering was the agency most concerned with and responsible for the planning and construction of most physical plant projects.

The process of planning and initiating projects in the category known as "municipal facilities projects" developed quite differently. ("Municipal facilities projects" include animal shelters, fire stations, police stations, branch City Halls, yards, shops, refuse disposal sites, parking facilities, libraries, and art galleries.) Those agencies responsible for operation and maintenance of the facilities planned and initiated projects, and the former Bureau of Public Buildings served as a service agency providing technical, architectural and engineering design, and construction supervision, within the specifications of the operating department.

In 1979, in the realignment of functions associated with the creation of the Department of General Services, the Bureau of Public Buildings was abolished and its functions of architectural and engineering design and construction supervision were transferred to the Bureau of Engineering. Therefore, at the present time, the Bureau of Engineering operates in two modes in relation to capital projects: (1) as a sponsoring agency for most physical plant projects; and (2) as a service agency to the sponsoring agencies for municipal facilities projects.

We believe an engineering organization is not the proper agency to carry sole responsibility for conceptual planning and initiation of facilities; and that such planning and initiation should directly involve the agency or agencies responsible for the program which utilizes the facilities or is responsible for providing the service. Facilities planning activities may actually distract the Bureau of Engineering from its primary mission: engineering design and construction supervision of approved and financed capital projects. The logical alternative course would be to develop a team approach to project initiation and planning. This approach appears to be the direction the present Department and Bureau leadership is taking, and we find this to be a most positive development. The only caution we have identified in this context, namely, the question of whether management has a role to play to ensure the sustaining of a cooperative environment, can be reasonably addressed by formalizing a requirement for mutual involvement of the key agencies.

The City Council, acting on recommendations of the City Administrative Officer contained in a 1977 Management Audit of the Department of Public Works, created a Department of Transportation (DOT). One of the fundamental reasons for establishing the DOT was to centralize authority over the conceptual planning of the City's system of streets and highways. The DOT now plans the system, and selects those projects to be considered for financing in the Capital Improvement Expenditure Program; the Bureau of Engineering provides advice based on its knowledge and expertise. After the projects are approved and financed, the Bureau provides design and construction engineering supervision, in accordance with the DOT specifications.

The projects for which the Bureau still provides preliminary planning and project initiation are landscaping, footbridges, storm drains, sewers, and wastewater treatment facilities. Landscaping projects and footbridges appear to relate to street projects now planned and initiated by the DOT and maintained by the Bureau of Street Maintenance. The Bureau of Sanitation operates and maintains storm drains, sewers and

wastewater treatment facilities. All of these agencies should be direct participants in planning and initiating projects relating to their operating responsibilities.

Recommendation

That the Board of Public Works, for the purpose of clarifying responsibilities in regard to the City's Capital Improvement Program, instruct the City Engineer to prepare for Board approval a policy directive which ensures that:

- a. The General Manager, Department of Transportation, and the Director, Bureau of Street Maintenance, will be provided full opportunity to participate in the planning and initiation of improvement projects involving footbridges and landscaping streets and highways.
- b. The Director, Bureau of Sanitation, will be provided full opportunity to participate in the initiation and conceptual planning of future sanitation improvement projects relating to storm drains, sewers and wastewater treatment plants.

II. Organization

A. District Office Design Function

Issue

The decentralized district office design concept for Capital Improvement Expenditure Program (CIEP) projects is no longer justified in terms of level of activity and funding requirements.

Discussion

In 1969-70, the Bureau of Engineering had 1393 authorized positions. Of this number, a total of 489 positions were authorized at seven district offices. In 1979-80, the Bureau had 990 authorized positions, excluding positions resulting from the additions from the former bureaus of Assessments and Right of Way and Land, and the architectural design function of the Bureau of Public Buildings. Of the 990 positions, 291 were authorized at five district offices. This is a reduction of 29 percent in Bureau-wide authorized positions and 40 percent in positions at the district offices. During the same period of time from 1969-70 to 1979-80 the purchasing power of the Gas Tax portion of the Capital Improvement Expenditure Program has been reduced by 52 percent due to the effects of inflation.

The level of personnel and the monetary value of the Capital Improvement Expenditure Program has shown a steady downward trend for the last ten years. A major casualty of these reductions has been the design effort at the district offices.

During the period from the early 1950's to the late 1960's, a great deal of growth occurred in the physical plant improvements in the City, and, correspondingly, in the staff of the Bureau of Engineering. Since the early 1970's the rate of growth of the City has decreased, and, as mentioned above, both the CIEP and the staff of the Bureau have been reduced.

With the passage of Proposition 13, the reduction in the number and scope of capital improvements has been dramatic. Funds have been shifted from that program to the street maintenance effort. The oil shortages of 1973-74 and 1978-79 have been instrumental in the reduction of gasoline usage and a corresponding reduction in the State Gas Tax collections. The physical improvements to the City have reached a stage in which fewer new streets will be required. The emphasis for the City

in the future will be upon requiring developers to provide necessary street improvements as a condition to development, and using available funds on street reconstruction and repair.

To serve these purposes, the district office structure is not required as it was during the City expansion through the 1970's. The district office concept for design of projects is a luxury the City can no longer afford in the post-Proposition 13 period. During the course of this Audit, we contacted various other engineering agencies, both public and private, for the specific purpose of reviewing design organization and project management methods. As discussed in other sections of this Report, we are recommending that the Bureau of Engineering adopt a positive project management approach which has been successfully implemented by some of the agencies contacted. A project management concept such as that proposed would be extremely difficult to control under the branch office concept. To be successful, the design divisions should be centralized to enable project managers to have full and immediate access to the project engineers.

The system, as it currently operates, is somewhat inflexible in terms of the workload at the five district offices. Each District Engineer is largely autonomous in deciding the priority of work to be accomplished in his district. While from time-to-time work has been reassigned between districts in recognition of variations in workload, this has happened relatively infrequently and with few projects. The reassignment of personnel between branch offices has taken place with even less frequency due to the steady reduction of personnel. District Engineers are motivated to do all within their authority to justify the retention of personnel in their districts. This, of itself, mitigates against the open transfer of personnel and work between districts. In addition, setting priorities within districts and divisions rather than on a City-wide basis incorrectly assumes top priority projects within each office are of equal priority. A centralized design staff could assign priorities City-wide based on objective criteria.

During the course of the Audit, the Audit Team found that the Bureau has been reluctant to develop priorities for capital projects. The Bureau is also reluctant to develop a measurable system to determine scheduling effectiveness and actual project completion as compared to work program. In addition, the current procedures diffuse project responsibilities between district offices and support divisions.

A centralized project management system would clearly delineate project responsibility and would encourage rapid completion of viable projects. Centralization of design activities would allow for rapid deployment of personnel based

on project criteria rather than district considerations. It would also allow for a reduction in district supervisory personnel and these positions could be used to staff a new project management division. A reduction in supervisory overhead is warranted in the districts based upon an analysis of supervisory ratios in 1969-70 compared with current personnel assigned. In 1969-70, there were 8.4 percent of the district staff at the Civil Engineer or above level. Currently there are 10.7 percent at that level. Based on this simple analysis, a reduction of seven higher-level positions in the districts could be possible.

A major consideration in centralizing the design effort will be finding sufficient space to house both the project management division and the consolidated design staff from the district offices. Another important consideration is the potential impact on Bureau employees. The increase in travel time and distance associated with the recommended centralization may motivate some employees to seriously consider alternatives such as retirement, termination, or other relocation possibilities. A phased approach to achieve the objective of the proposal would provide time to address the space concern in the Civic Center, and give affected employees an opportunity to make personal adjustments to a new work location.

Recommendation

That the Board of Public Works instruct the City Engineer to:

- a. Centralize the design activities of the district offices into the Civic Center area utilizing a phased approach over a two-year period.
- b. Reorganize the Bureau to bring the entire design effort under the direction of one Deputy City Engineer at such time that Recommendation a. above has been accomplished.
- c. Upon completion of a. and b. above, or concurrently therewith, eliminate through attrition one of the three existing positions of Deputy City Engineer.

B. District Office Private Development Engineering

Issue

Consistent with the intent of the preceding recommendation is the related need to retain in the geographic

districts the remaining activities now performed there, specifically, public counter services, private development processing and mapping maintenance.

Discussion

Interviews were conducted with personnel in all district offices in order to develop information on the nature and volume of workload in public counter services and private development processing. Available workload statistics were obtained and evaluated.

West Valley District Office

Although there are some processing variations depending on the particular permit, generally the work statistics, supported by observation and interview, indicate that the workload in the West Valley District Office is substantially less than in any other district office except the Harbor. The West Valley Office is about eight miles from the East Valley Office. There is no Building and Safety or Planning Department office at the West Valley District Office location.

The East Valley Office is located in the Van Nuys Civic Center complex where the departments of Building and Safety and Planning also have offices serving both East and West Valley.

Evaluating the various factors, closure of the West Valley Office entirely, and transfer of the public counter services, private development processing and mapping maintenance activities and personnel to the East Valley Office is clearly indicated. The combined public counter staff of 12 could be reduced by three or four positions and still complete the combined workload. The combined private development staff of 16 could be reduced one or two positions and still complete the combined workload. These economies from consolidation can be achieved with minimal inconvenience to the public, who, in many cases, must travel to the Van Nuys Department of Building and Safety Office in connection with the same project.

Harbor and West Los Angeles District Offices

The Harbor Office is located in the San Pedro Municipal Building about 25 miles from either West Los Angeles District Office or the Central District Office in City Hall. Both the Building and Safety and Planning Departments also have offices in the San Pedro Municipal Building. From the workload statistics it is obvious that the public counter and private

development activities are very small. The number of personnel devoted to these activities (five) is also small. Evaluating the various factors, economies from consolidation would be small, but inconvenience to the public would be great.

The West Los Angeles Office is located about 15 miles from the Central District Office in City Hall. Both the Building and Safety and Planning Departments have offices in the West Los Angeles Municipal Building. From the workload statistics, observation and interview, the public counter and private development activities are significant. A total of 13 personnel are assigned to these two activities. Evaluating these various factors, economies from consolidation could be significant, but inconvenience to the public would be great; therefore, public counter services and private development processing should continue at both West Los Angeles and the Harbor.

Centralized Permit Processing Centers

At both the Harbor and West Los Angeles locations the Department of Building and Safety maintains a branch office in the same buildings as the Bureau of Engineering district offices. The Planning Department staffs its offices part time, one planner dividing time between the two locations. By combining in the Building and Safety facilities the public counter activities and personnel now provided by the three departments at those locations, centralized permit processing centers similar to that planned for City Hall could readily be established at the Harbor and West Los Angeles. Organizationally all personnel would continue to report to their respective departments.

Although no immediate savings in staff can be anticipated, all the benefits projected for the City Hall central permit processing center in terms of improved service to the public should result. Those benefits, as outlined in the report of the City Task Force on Building Permit and Subdivision Processing of February, 1979, include:

1. Provide a convenient permit service center for land development matters including processing for building permit applications.
2. Facilitate streamlining permit procedures by grouping key functions and improving work flow of necessary activities in one area.
3. Provide a team effort between the City staff of the various departments in order to more efficiently coordinate procedures and practices in processing building permits.

4. Reduce the number of applicant referrals and misunderstandings between departments, City staff and the public by improved communication, practices, and policy resulting from the close association in a center environment.
5. Provide the necessary assistance and counseling in order to help the citizen stymied between two apparently conflicting department regulations or procedures.
6. Reduce duplication of information sources now presently used, such as:
 - a. A single set of zoning cases rather than two separate sets.
 - b. The combining of information on district maps, thereby reducing the total number of sets required.
 - c. The possible combining of Planning and Building and Safety cartography staff and equipment, thereby resulting in an additional savings to the City.

The small number of personnel involved in the various branch offices will facilitate a mutual increase in familiarity with the activities and requirements of the other City departments, resulting in better service to the public. Eventually, these advantages may result in the ability to reduce the total number of personnel of all three departments and still maintain a high level of service.

Alterations and improvements to the Department of Building and Safety facilities at West Los Angeles and Harbor to accommodate the suggested alignment should be minimal.

At Van Nuys, operations of the three departments are much larger. Also, the Bureau of Engineering and Planning Department are in the Van Nuys City Hall, whereas Building and Safety is in a separate building. Accordingly, a centralized permit processing center in Van Nuys would be more difficult to achieve and may involve an extensive physical alteration and improvement effort. We encourage the concerned departments to initiate a thorough study of the relative advantages and disadvantages of such a center in Van Nuys.

Mapping Maintenance in District Offices

In 1978, the Bureau initiated a pilot program to study conversion from map preparation using negative scribing techniques to a computer assisted mapping program. In April, 1981, the Bureau began full scale operation of a project to create a computerized geographic data base containing the information previously shown on the base district/cadastral map series. The Bureau's two goals were to:

1. Convert all existing district maps to a geodetic coordinate system of base maps; and
2. Digitize the district maps for storage and access on the computerized mapping system.

The Bureau reports that it will require 1,294 base maps to cover the City's new geodetic coordinate base map system. As of March, 1982, 648 base maps have been prepared, approximately 50 percent of the total required to cover the City. Of these, 481 are manually prepared hard-copy maps, and 167 have been digitized and are stored on the Bureau's automated tape storage system.

The production rate for complete conversion to the new Automated Mapping Program is significantly below the rate which had been projected for a variety of reasons, including difficulties in retention of qualified cartographic personnel and difficulties in equipment performance. However, the Bureau has analyzed these problems and initiated corrective actions.

The Bureau considers the project as fully cost effective. When the information needed for the cadastral map series is fully automated the maps will be able to be maintained by fewer personnel. Revenue from the sale of the computerized data base has also emerged as a distinct possibility.

At the time of our Audit the Bureau's organization charts indicated that approximately 36 authorized positions were engaged in mapping maintenance and related activities in the district offices. The extent to which these personnel will be needed in the district offices in the future will depend on the progress in completing the installation of the Automated Mapping Program and the mechanism that is developed to maintain maps in the district offices. The need for retaining mapping maintenance personnel should be reevaluated at that time.

The following conforming recommendations are based on the assumption that the preceding recommendations to centralize the design activities to the Civic Center area will be implemented.

Recommendations

That the Mayor and Council instruct the Board of Public Works, the Superintendent of Building and the Director of Planning to form centralized permit processing centers at the West Los Angeles and Harbor areas, by relocating public counter personnel of the Bureau of Engineering and the Planning Department to the facilities now occupied by the Department of Building and Safety at those locations. Further, instruct said heads of departments to participate cooperatively in a thorough study of the relative advantages and disadvantages of forming such a center in Van Nuys.

That the Board of Public Works take the following actions to improve the efficiency of district operations:

- a. Instruct the City Engineer to close the West Valley District Office entirely and transfer all activities, excluding design, to the East Valley District Office, and to transfer design activities to the Civic Center in accordance with a foregoing recommendation.
- b. Instruct the City Engineer to retain public counter services and private development processing activities and personnel at both West Los Angeles and Harbor District Offices following the centralization of the design activity.
- c. Instruct the City Engineer to retain mapping maintenance activities and personnel at the East Valley, West Los Angeles and Harbor District Offices pending completion of the transition to the Automated Mapping Program at which time the need for mapping maintenance personnel in the district offices should be reevaluated by Bureau and Department management.

C. Architectural and Structural Engineering Design

Issue

Architectural design and structural engineering services within the Bureau of Engineering are currently provided by both the Architectural and Structural Engineering Divisions.

Discussion

The Architectural Division provides architectural design, including electrical, mechanical, and landscape, as well as structural design for municipal facilities projects and the Alterations and Improvements Program. On occasion, the Division will assist in designing wastewater treatment facilities. During the Audit, architectural positions from this Division were temporarily assigned to Wastewater Systems Engineering Division to work on the Sepulveda Water Treatment Plant and the Hyperion Energy Recovery System (HERS) projects. The Architectural Division was previously located in the former Bureau of Public Buildings.

The Structural Engineering Division provides structural, architectural, and landscape design services for wastewater facilities and bridge construction projects.

The functions of the two divisions are sufficiently complementary to warrant functional consolidation into a single division. The consolidation would have the benefits of offering greater flexibility and efficiency in staffing to meet fluctuating workload, and would provide consistent management to the architectural and structural design functions. A direct cost savings would also be realized through the elimination of one division head (Principal Engineer level). Furthermore, since both existing divisions presently staff resources for structural, architectural, landscape, and clerical activities, there appears to be sound potential for additional position economies.

Recommendation

That the Board of Public Works instruct the City Engineer to take all necessary steps to consolidate the existing Architectural Division and the existing Structural Engineering Division into a single organization, within a timeframe which acknowledges personnel management considerations.

III. Workload Analysis

In reviewing the workload of the Bureau of Engineering, we found two basic types of work being performed. The first type is represented by the engineering projects which begin and are completed through adherence to a "project network". These projects require an interaction of various disciplines and skills from project design, through EIR evaluations, and to construction coordination. Because project completion follows a network, these projects are "time critical", meaning they contain elements which cannot be impacted by providing additional staff resources. There are other work elements performed by the Bureau, such as B-Permit processing and tract map review, the output of which is directly measurable; the volume of production can be directly impacted by changes in staff resources.

Because of the two types of work performed within the Bureau, the workload of each must be analyzed separately. The workload subject to a network process for completion can best be measured in terms of the total staff hours required to complete it. The workload that can be converted to work units can be measured in terms of the number of work units completed. Most of the work within the Bureau can be subjected to network evaluation.

The conclusion that the network method of workload analysis was most appropriate to engineering systems was reached after reviewing the workload analysis and project management systems in place in various public and private entities. The most successful programs, as identified by the Audit review, utilize this methodology.

Although the Bureau utilizes work units for certain elements of its workload, specifically the review of privately-financed construction, the Audit Team found that staffing standards for the completion of a work unit were inconsistent and varied from engineering district to engineering district. For that portion of the Bureau's work program which can and should be subject to network analysis, by far the largest and most significant part of its workload, we conclude that the Bureau's efforts are deficient.

The Bureau maintains a list of approved projects and their associated cost and staffing requirements, but there is no resource management system geared to the efficient utilization of resources to complete projects expeditiously. There is no system of project completion accountability. The current methodology is very lax and allows project requirements to be

adjusted upward without significant management review. There is no post audit to determine if projects have been completed within a projected time frame or budget. Ironically, the performance shortfall which a post audit would identify is "rewarded" each year in the City's Fee Report, which essentially approves the Bureau's cost overruns on projects by reimbursing the General Fund for excess costs on those projects which have accrued deficits.

A. Excessive Number of Work Orders

Issue

There are numerous open work orders in the Bureau of Engineering which have questionable validity, and which create distortion in the assessment of the Bureau's workload.

Discussion

At the time of the Audit, there were approximately 5,700 open work orders in the Bureau of Engineering. Excluding the work orders for public buildings, right of way, and B permits, there were almost 2,200 general engineering work orders that ranged in complexity from simple engineering designs to major street improvements and sewer and storm drain developments.

With this number of projects, it is not possible for the Bureau to focus full attention on each one during a given fiscal year. A review of the Bureau's Cost Ledger indicates that between May, 1980, and April, 1981, there were almost 900 projects that had no charges recorded against them. For all practical purposes, these projects were inactive either because there was not enough time to work on them or some technical requirement prevented further progress. Of the 900 projects identified above, 400 had no time charged against them for a two-year period.

The fact that the Bureau has so many open work orders precludes any substantive measurement of its workload. The backlog that is identified has become a reservoir of work to be performed some time in the future; it is backlog only because it represents something to be done. It does not, however, represent a discrete amount of work that must be performed with any urgency.

Frequently, projects are included in the program which cannot be worked on. An attempt was made during the Audit to reconcile budget with staffing requirements, but information from the Bureau indicated the effort was not realistic because money is frequently available for work that cannot be done; or the costs of project design are underestimated which

necessitates that funds be moved from right of way or construction elements to support design activities.

We suggest that the production efforts of the Bureau would best be served if the number of open work orders were reduced to a figure representing an expected level of accomplishment for a program year. This workload should be based on the resources available and should establish a production goal for the year. Under this concept, the work that is not completed during a particular year would be the backlog and its carryover to the next year would be subject to a reevaluation of priorities. Those currently open work orders that are not included in the active priority work program should be reduced to inactive status so that charges cannot be recorded against them.

Recommendation

That Bureau management review all of the general engineering work orders and:

- a. Delete all obsolete work orders, and submit a listing of all such work orders, together with those identified in b. below as "inactive", to the Board of Public Works and the City Administrative Officer for review and concurrence.
- b. Divide the remaining viable work orders into active (those to be worked on in the current fiscal year) and inactive categories.
- c. Remove all inactive work orders from resource or budget consideration and prohibit any expenditure of resources on them.
- d. Through periodic (quarterly) review of the cost accounting records, hold the District or Division Engineer responsible for making sure that inactive work orders do not utilize Bureau resources without management or Board authorization.
- e. Identify, using the current year adopted budget as a base, the expected level of resources available to perform the work (active work orders) assigned to the Bureau.
- f. Identify the resources that will be available for design activities by subtracting resources required for public counter services (B permit, parcel maps, etc.) and contingency design services.

- g. Relate design resources to projects and eliminate from the annual work program those projects to which no resources can be assigned.
- h. Do not approve interim projects unless resources are made available by Mayor and Council to complete them.

B. Project Priorities

Issue

The methods employed by the Bureau to assign project priorities do not enable management to clearly direct production toward the completion of the most important projects.

Discussion

The Bureau of Engineering has two priority categories for capital projects - special and routine. Special priority projects are those that are to be expedited for the following reasons: (1) the Health Officer's report or severe accident record indicates urgent need for improvement, (2) coordination necessary with outside agency, (3) financial requirements and deadlines, (4) avoidance of work during rainy season, Christmas season and other events causing heavy traffic, (5) acquisition completed in advance to avoid proposed private development or reduce problems in "hardship" cases, and (6) restoration of schedule on delayed project. All other projects, which include the great majority of the Bureau's projects, receive routine priority with no other relative priority designation.

One of the ways the Bureau attempts to assign priorities to its work is by use of "bar charts" or workload scheduling forms. The Bureau uses the bar charts to identify the projects to be worked on during a given period and the resources to be devoted to the projects, and to record the amount of work or effort that remains until project completion. This form serves as a vehicle to select and assign priorities to the projects to be worked on during a given period.

The above method of assigning project priority is inadequate because:

1. It ignores the fact that districts can and do substitute projects from the list of open work orders not included in the bar charts. Such substitutions are made without reviewing the impact on the workload which has been set down as a priority. At the time of the Audit, project substitutions could be made on a District Engineer or Project Engineer level with little if any management review, thus rendering the priorities meaningless.

2. The original selection of projects for the assignment of Bureau resources is completed without significant management input or review.
3. At the conclusion of the program year, projects are not reviewed for progress to determine if the effort expended coincided with the original project priority.

The determination of work priorities has been historically at the discretion of the individual districts. Workload, available staffing, status of project financing, delays or interruptions on other projects, concerns of the Councilmember and of Bureau personnel are among the determinants of project priorities. Currently, each engineering district has a "top ten" list of projects indicating the ten most important projects within the district. These priorities may not be based on the priorities established by the requesting department (if any) in its submission to the City Administrative Officer for the preparation of the Five-Year Capital Improvement Program.

As the project progresses from the design division to each of the other functional divisions such as Opening and Widening, Real Estate, Coordinating and Engineering Services, the project must again compete with other projects based on that particular division's priority criteria.

A Bureau-wide priority system is an essential tool for management to direct the overall accomplishment of the Capital Improvement Program. The treatment of all projects as if they were of equal priority can result in an unequal distribution of effort.

Recommendation

That the Board of Public Works instruct the City Engineer to devise a centrally-controlled, Bureau-wide priority system for the orderly and expeditious completion of projects, using as guides the priorities assigned to a project by the requesting agency and the availability of funds or the potential of the project for future funding.

C. Workload Management

Issue

The Bureau of Engineering does not have an effective workload analysis and resource utilization program and as a result does not effectively manage its workload.

Discussion

Webster defines workload as, "The total amount of work to be performed by a group (as a bureau) of workers in a period of time." The essence of this definition focuses on the amount of work to be done, and the time allotted to perform that amount of work by a specific group.

The application of this definition to the Bureau of Engineering indicates the absence of a workload analysis system. The Bureau defines its workload as the total of the open work orders awaiting completion. These work orders represent the sum of the requests for Bureau services as encompassed in the Capital Improvement Expenditure Program and directives of the Board of Public Works. The missing element in the definition is the almost total absence of a time frame. (Furthermore, there is a fundamental requirement for a funding commitment from the operating agency which constitutes a prerequisite to the inclusion of a project in the work program.) It is true that each year bar charts and project status reports are maintained for most projects but the goals for resource utilization (budget and staffing) and completion are ineffectively monitored. The absence of meaningful goals for project completion reduces the Bureau's defined workload to that body of work which will be accomplished "someday".

The ability to define workload in terms of the amount of work to be accomplished in a given period of time is the basis for an effective workload management system. The absence of a defined workload has resulted in unreliable workload management. The Bureau's workload management difficulties can be demonstrated by four different factors.

1. Federal Aid Urban (FAU) Program processing delays - The City is continually on the verge of losing some of its FAU funds because it has not been able to complete projects within the four year program period established in the Federal regulations.
2. Annual Fee Report appropriations - Each year the CAO prepares an Annual Fee Report that transfers funds from the Gas Tax Fund to the General Fund to support Bureau of Engineering expenditures that exceed budget. The Fee Report is a recognition that the Bureau has exceeded budget authority in the design of certain projects, and is a design cost overrun adjustment. Fee Report adjustments for the Bureau of Engineering from 1977-78 through 1980-81 totaled \$9,527,581.

1977-78	\$2,372,000
1978-79	3,491,000
1979-80	1,615,025
1980-81	<u>2,048,756</u>

\$9,527,581

3. Inactive projects - Of the 2,200 active general engineering work orders, the Audit identified almost 900 which had had no charges made against them for at least one year. Many of these projects were inactive because there were insufficient resources available to work on them.
4. Change in time required to complete projects - Since 1971, the average time required to complete engineering projects has increased 48 percent from 37.1 months in 1971 to 55.0 months in 1980. Obviously, the size of a project constitutes a significant variable which directly influences these figures. (See Table A, pg. 68.)

The Audit Team recognized that the work of the Bureau does not lend itself to precise quantification. In an attempt to identify workload measurement alternatives that could be introduced into the Bureau, contacts were made with certain public and private engineering agencies. The agencies contacted were uniform in their opinion that standards that equated a specific design activity to a definitive staffing requirement could not be developed with any degree of precision. However, it was equally apparent that the well managed engineering operations utilized their experience developed over time to predict the level of project completion that could be expected for a given period of time for a specific level of staffing. These agencies reduce the various design problems peculiar to their organizations into basic work elements and then staff the elements in accordance with historically determined performance levels.

The identification of the relationship of staff requirements to workload is approached in different ways by different organizations. The Department of Water and Power has elected to utilize a consultant to identify the workload or staffing requirements for discrete elements that make up a design program. Although this methodology could be applied to the Bureau of Engineering in the future, we believe the time and cost necessary to develop such a study and implement the results are unwarranted at this time when there are more basic unmet needs. We do, however, encourage the Bureau to seriously consider the potential applicability of design standards as a second level of effort beyond the recommendations of this

Report. An alternative approach utilized by other public and private engineering entities is to develop a critical path flow for the various types of design projects and through historical records determine the time and staffing requirements for the discrete elements or segments that make up the design process. Although not as precise as the Water and Power approach, this methodology provides a development standard that can be adjusted for each project and thus provides a tool for projecting requirements.

The successful engineering agencies identify the projects to be worked upon during a given period of time and the resources to be assigned to each project. Staffing is based on available resources, project priority, and project phase. The Bureau of Engineering has the elements, with certain additions and modifications, to perform a workload analysis of its projects and to assign its resources to complete tasks in accordance with a planned schedule. What is required is a commitment by management to implement such a system.

For example, Bureau staff can reduce the various project types (street improvements, storm drain, sewer, etc.) to their basic task elements. Staffing and performance criteria can be established for each element based on experience. To utilize this information, Bureau management must develop a scheduling tool which applies workload and resources to produce an implementation plan. Other public and private agencies have developed or purchased computer software programs to schedule projects and maximize the deployment of their staff resources.

A review of projects completed through 1974-75 suggests that the various types of projects--assessments, CIP, sewer, combination, etc.--have an identifiable mean processing time and design-cost-to-construction-cost ratio. Initially, it is suggested that this basic yardstick approach be used by the Bureau to develop workload indicators and resource allocation models. There may be other alternatives which have greater statistical merit than this, but the same concept is applicable.

If this methodology were merged with the already existing work unit data that is being collected for the B Permit and tract map processing services, the Bureau would be able to predict its workload and resource requirements with greater accuracy. Such a system would have the following benefits to the Bureau and the City.

1. It would allow the Bureau to formulate project performance schedules which can be used to measure performance.

2. It would allow Bureau management to assess at the outset whether the work program as assigned is consistent with available resources, and whether reasonable progress can be made toward implementation.
3. Finally, the schedule of implementation for each project would be available to all interested parties-- Council, Bureau management, Board members, CAO, etc.-- and could be used to inform all as to the progress that was expected and that is being made. This kind of information will serve as a vehicle to obtain outside input when resource reallocations are needed.

Recommendation

That Bureau management, for all active projects:

- a. Develop an up-to-date Project Status Report to be kept current through monthly revision.
- b. Utilizing the History of Projects File, develop average expected time frames for completing different project types: assessments, street improvement, CIP, storm drain, combination, etc. Utilize this information in the development of a critical path network for all project types and incorporate critical decision and action points into the Project Status Report. Develop an exception reporting system for the Project Status Report to identify the projects approaching action decision points for management status review.
- c. Develop staffing patterns derived from cost ratios and professional expertise.
- d. Establish expected completion or accomplishment dates for each critical decision or action point.
- e. Identify the resources required to progress through the network and assign resources to the network segments in accordance with management priorities for expediting completion.
- f. Have the District or Division Engineer review project progress on a monthly basis, with Bureau management review at each major decision or action point identified in the Project Status Report.
- g. Conduct a yearly management review of each active project which varies \pm 10 percent or more in time or resources to determine the degree to which project

progress approximated the program expectations and document in the Project Status Report any causes for deviation.

- h. Provide the Mayor, Council and City Administrative Officer with a list of engineering projects and the schedule for their accomplishment for each new budget year. Further, at the conclusion of the budget year, provide the Mayor, Council, and CAO with a report comparing project progress (performance and budget) with the original program projections.

IV. Capital Improvement Program

The Five-Year Capital Improvement Program is a schedule of projects proposed for financing during each of the ensuing five years, along with estimated costs and sources of funds. It is prepared by the City Administrative Officer with assistance from the Technical Committee for Capital Programming, which consists of department or bureau heads of various technical functions of the City. The Five-Year Program is submitted to the Public Works Committee of the Council which considers the projects and forms recommendations to the Mayor and Council on projects to be included in the annual budget.

The Capital Improvement Expenditure Program (CIEP) is that portion of the budget which finances the design, real estate acquisition, if any, and construction of capital projects. Generally, the first year of the Five-Year Capital Improvement Program becomes the CIEP.

Over the years, it is taking an increasingly longer time to accomplish the projects approved in the CIEP. The average length of time to complete projects in 1971 was 37.1 months, compared with 72.1 months in 1979 and 55.0 months in 1980. Additionally, approximately 41 percent of all new capital improvement projects approved for design in the years 1970-71, 1971-72, and 1972-73 have not yet been constructed.

Table A
Projects Closed and Average Months to
Complete By Year of Completion

<u>Year Project Completed</u>	<u>Total Projects Closed</u>	<u>Average No. Months to Complete</u>
1971	209	37.1
1972	131	42.2
1973	107	41.1
1974	77	46.1
1975	144	47.5
1976	179	46.8
1977	183	41.4
1978	204	39.2
1979*	229	72.1
1980	156	55.0

*If projects for the 1958 and 1964 Sewer Design Bond Issues and the 1971 Earthquake are deleted from the 1979 total, the adjusted total then becomes 208 projects with an average processing time of 65.4 months.

In order to determine the significant milestones and points of project delays, the Audit Team randomly selected several project files and reviewed the processing steps from the start of design to completion of construction. The process of planning, designing, acquiring property and constructing capital projects is complicated and involves hundreds of individual steps requiring extensive coordination between several internal and external organizations. In summary, the process usually involves: (1) preliminary plans, which includes sufficient design to base an environmental evaluation and application to a granting agency for possible grant funding; (2) environmental evaluations, which includes the preparation of either a categorical exemption, a negative declaration, or environmental impact report; (3) project design, which includes all activities necessary to prepare final plans; (4) plan circulation, which includes the review and approval of plans by the various concerned engineering district or division heads, other City departments or agencies having an interest in or responsibility for portions of the project, and approval by the City Engineer; (5) acquisition of right of way, which includes title searches, appraisal, negotiation, and often relocation and condemnation; (6) plan processing, which includes the preparation of final construction cost estimates and bid documents; (7) the advertising and awarding of the construction contract; and (8) construction engineering supervision and contract administration. Also included throughout this process are reviews by the grantor agency if the project is to be funded by a grant.

In the case of a FAU project, the California Department of Transportation (CALTRANS) must review the scope and intent of the project to determine eligibility for grant funds and then must: (1) review and approve plans and environmental documents; (2) approve proceeding with right-of-way acquisition; (3) approve advertising for bids; and (4) approve awarding of the construction contract.

The Bureau's procedures to accomplish these steps appear, for the most part, to be adequate. However, the major impediment to expeditiously completing projects is the lack of continuous management attention to that goal. A project is designed in a design division and then must also be processed through several other functional divisions within the Bureau such as Coordinating, Opening and Widening, Real Estate and Engineering Services, as well as being reviewed by Bureau management. At each of the functional processing and review

steps, a different individual is responsible for the project. This functional accountability does not lend itself to overall project accountability to assure the proper and efficient coordination necessary to expeditiously complete a project.

Some of the other major causes for project delays include: interruptions because of emergency work, such as earthquake and storm damage; constant interruptions of the design staff to research and respond to inquiries from the public, City personnel or elected officials regarding other active or inactive projects; excessive "red tape" and review periods by various Federal and State agencies on grant-funded projects; excessive time to circulate and review final plans; lack of adequate information to accurately project the completion of certain phases of a project to assure that funds are budgeted for the next phase; and revision of plans due to the delays in getting projects ready for construction in a timely manner.

The implementation of a project management and control system, as described in more detail in Section V of this report, placing the accountability for a project with one individual will, with full management support, significantly improve the Bureau's processing time and accomplishment of capital projects and eliminate or reduce the above-mentioned delays. The following discussion concerns issues outside the control of a project management system which will improve project processing.

A. Approval of Construction Bids which Exceed Appropriation

Issue

Construction bids are often received that exceed the amount of funds previously appropriated for construction. When the amount needed to award a construction contract exceeds the amount of funds available by more than \$25,000, Mayor and Council approval is required, usually delaying the project from one to three months.

Discussion

When construction bids are received that exceed the amount of funds appropriated for construction, the Board of Public Works, upon determination that the bids are reasonable, must request that additional funds be provided.

The City Administrative Officer is authorized to approve transfers of up to \$25,000 from the contingency accounts of the Capital Improvement Expenditure Program (CIEP) to projects for the purposes of awarding construction contracts for

an approved project, for unforeseen contingencies and change orders which do not alter the original scope of the project, or to complete an acquisition. Any need for funds for these purposes in excess of \$25,000 must be approved by the Mayor and Council. The process involves the preparation of a report for review and approval by the Board of Public Works, the City Administrative officer, the Mayor, the Finance and Revenue Committee, the Council, and again the Mayor for concurrence. This process can take from one to three months and delays the award of the contract and start of construction. On the other hand, it takes only about two to three weeks to process a request to the City Administrative Officer for a transfer of funds.

The authority for the CAO to transfer up to \$25,000 from contingencies to Council-approved projects is contained in the annual budget and was increased from \$5,000 to the current amount in the 1973-74 budget. Since then, however, inflation has increased significantly enough, especially in the construction industry, to merit another increase in the amount. The CAO's authority should be modified to allow transfers up to \$75,000, or 25 percent of the proposed contract amount, whichever is less. This amount is appropriate in terms of today's construction costs and would eliminate many of the routine requests which must be approved by the Mayor and Council, while still providing them an opportunity to review projects for possible downscoping or cancellation where bids exceed the available financing by more than 25 percent.

Recommendation

That the Mayor and Council increase from \$25,000 to \$75,000 or 25 percent of the proposed contract amount, whichever is less, the City Administrative Officer's authority for transferring funds from the contingency accounts of the Capital Improvement Expenditure Program to approved projects for the purposes of (1) awarding a contract, (2) completing a contract requiring additional funds because of unforeseen change orders which do not alter the approved scope of the project, or (3) completing an acquisition.

B. Approval of Construction Contract Change Orders

Issue

The process of approving construction contract change orders by the Board of Public Works can delay some projects by several weeks.

Discussion

It is the policy of the Board of Public Works that it approve all contract change orders in excess of \$15,000. The City Engineer is delegated the authority to approve change orders up to that amount, not to exceed 25 percent of the contract.

Change orders to construction contracts are initiated in the district office that designs the project and must be approved by the District Engineer, the Coordinating Division Engineer, and the City Engineer. There are occasions when a change order will be required that, if not approved expeditiously, will delay continuous construction on a project. In those instances when the change order is in excess of \$15,000, a delay of two to three weeks may occur while the Bureau prepares and submits a request to the Board of Public Works for approval.

An increase in the maximum amount that the City Engineer is authorized to approve to \$25,000 would be more realistic in today's economy and would reduce the processing time for those change orders falling within that amount. Indications are that approximately 25 percent of the change orders are under \$25,000. The Board of Public Works would still have an opportunity to review significant project change orders.

Recommendation

That the Board of Public Works modify its policy regarding the approval of construction contract change orders by delegating to the City Engineer authority to approve change orders up to \$25,000, not to exceed 25 percent of a contract.

C. Charter Compliance: Execution of Construction Contracts

Issue

Charter Section 386 states that the successful bidder for a construction contract must submit the necessary faithful performance bonds and liability insurance forms and execute the contract within 30 days of the award by the Board of Public Works, or be declared in default and forfeit the bid bond. Over half of all contracts awarded by the Board of Public Works are executed more than 30 days after the date of award.

Discussion

It can take up to eight weeks or more to execute a construction contract after it is awarded by the Board of Public Works. Once the contract is awarded under current practice, the

Board of Public Works sends the bid package to the City Attorney for preparation and transmittal of the bond documents to the bidder. This is usually done within several days after the award. Upon return by the bidder, the City Attorney reviews and approves the completed bond, insurance, and contract documents and forwards them to the Board of Public Works for execution.

The City Attorney does not monitor or follow up on the bidder's progress in completing the forms and returning them to the City. With few exceptions, the Board of Public Works also does not follow up on the bidder's progress. Without stricter enforcement of the Charter provision, bidders can delay the submission of the contract, bond, and insurance forms when it would be to their advantage to do so.

Recommendation

That the Board of Public Works, in conjunction with the City Attorney, develop and implement a notification procedure for the Board with respect to the transmission of contract documents to the bidder. Further, that the Board of Public Works monitor the bidder's progress in submitting the completed documents to the City Attorney. (A cooperative effort should be made to execute contracts within 30 days with stricter enforcement of the Charter provision by the Board of Public Works.)

V. Project Management and Control

The life of a typical improvement project in the Bureau of Engineering may be briefly described as follows:

A district office or design division recognizes the need for an improvement project and initiates a request. Eventually, the Council and Mayor concur and the project is financed. The originating office opens a work order, assigns it to a design squad which sets a schedule and in due course completes the design. If additional right of way is required, the district or division engineer will request the Real Estate Division to process acquisitions. Upon availability of right of way, the district or division will forward the project to the Coordinating Division along with all responsibility for the project.

The Coordinating Division processes the plans for signature and forwards the project to the Construction Division, along with all responsibility for the project. The Construction Division estimates construction costs, prepares bid specifications, obtains Board of Public Works permission to advertise for construction bids, advertises, analyzes bids, and recommends award of contract. During construction, the design engineer in the original district or division monitors construction, progress payments to contractors, and initiates required change orders, which are subsequently processed by the Coordinating Division. When construction is complete, the Board accepts the project and the work order is closed.

A. Project Management Organization and System

Issue

There is no discernible project management system in the Bureau which a) places continuing responsibility for a project from beginning to end; b) assigns to a specific individual direct responsibility for project accomplishment; c) provides for periodic review of project status by Bureau management; or d) provides for a post-audit of performance measured against staffing, budget or time estimates.

Discussion

It can be seen from the project life history described above that there is no person or group which has overall responsibility for bringing a project to construction. Different groups are responsible for accomplishment of certain milestones along the way, but no one has primary responsibility for accomplishment or authority to speed up project progress.

Consequently, the time required to move a project through all the steps to construction is excessively long and apparently growing longer. The Bureau is aware of this fact and has taken some action subsequent to Audit Team observation to reverse or slow this trend. (Statistics documenting the time required for completion of projects are presented in the Audit Report section on the Capital Improvement Program).

The Bureau has utilized a Project Status Report for several years, but its usefulness had deteriorated at the time of the Audit. The report shows, for each project, a list of milestones and the scheduled date for accomplishment. The procedures for collecting information for the report are very informal: telephone calls by a clerical person to the design squad or other group working on the project. If a task is not accomplished by the scheduled date, the schedule is automatically advanced by three months. There is no management review of the data entered into the report, or of the report itself. Management evidently places little value on the report since no report was produced between July, 1980 and March, 1981, although it is supposed to be produced monthly. In the absence of a current Status Report, it is difficult to determine the location or status of any individual project.

At the time a work order is opened, a project is either designated "special" or "routine". Those projects required to protect life, to prevent damage to property or to protect public health are designated special; all others are routine. Almost all projects are routine; therefore, there is no effective system for assigning priorities to projects. Each design office is free to determine which project will be worked on first.

All of the points discussed above are shortcomings which hinder or do not contribute to the accomplishment of projects. We have concluded that the majority of project delays experienced, which are not the result of external regulations (FAU, for instance), may be eliminated or mitigated by establishment of an effective project management system.

An effective project management system should include the following features.

- * A priority list prepared by Bureau management which ranks all projects, both new and old, in descending order and prescribes the order in which projects will be worked on.
- * A scheduling system which schedules the accomplishment of all projects. The schedule should include date of accomplishment and work hours required for

accomplishment by category of personnel. Amendments to the schedule may be made by district or division engineers with the concurrence of the project manager, or by a representative of top management. In every case, the reason for the amendment should be indicated.

- * A project manager who is responsible for the accomplishment of the project schedule. The manager could participate in the scheduling process and in making amendments to the schedule. The project manager would not be a member of the design team or the design organization, and would report independently to the head of the project management division.
- * A reporting system which produces periodic timely reports on project status. The report should include, by project:
 - * Schedule. The original scheduled dates for accomplishment of major milestones and revisions to scheduled dates.
 - * Work hour requirements, both original estimates and revised estimates, and actual utilization to date.
 - * Financial data, including original cost estimates, revised estimates, and availability of funds.
 - * Comment on problems or delays incurred or anticipated.

This data may be incorporated in one report or contained in several related reports.

- * Management review, consisting of a scheduled review by a representative of top management, of project status on a monthly or other periodic basis, with project managers and district and division heads. This review may result in orders to change schedules or priorities in order to expedite completion of projects.
- * Post audit of projects upon completion, to identify problems and suggest means to avoid problems in future projects.

Some of the elements of an effective project management system are already in existence and may be incorporated in the proposed system. The Bureau has recently designated a Deputy City Engineer as the individual charged with

the responsibility to maintain control of projects and expedite their completion. We propose that the recommended project management division be assigned to the supervision of that Deputy.

A member of the Board of Public Works was conducting scheduled reviews of major project status on a regular basis at the time of the Audit. This review may be continued or replaced by review by the Deputy City Engineer responsible for project accomplishment.

The existing Project Status Report may form the basis for an expanded, more comprehensive status report. Data on project funding is available in the MIMIS reports. The existing bar charts may provide a beginning for the scheduling system. The "Top Ten", a listing of the highest priority projects in each district and design division, may be expanded into a Bureau-wide priority list.

In view of the current and foreseeable budgetary limitations imposed upon the City, it is appropriate that a project management division be created from existing personnel resources. We believe the resources for such a unit may be obtained by reapplying personnel savings resulting from recommendations contained in this and other sections of this Report. These include:

- * Elimination of district design organizations.
- * Reduction of design force through contracts for design services with private engineers.
- * Savings produced in many areas through more efficient processing of projects brought about by the project management system.

It may be desirable to assign some of the functions now performed by existing functional divisions, such as the Coordinating Division, the Administration Division, and, particularly, the Construction Division, to the proposed project management division. Such an arrangement could reasonably result in the elimination of one of the functional divisions.

The project management division should be staffed with Civil Engineer-level persons as project managers to enable them to relate professionally and effectively with design personnel in other divisions.

The Management Audit Report of the Department of Public Works of July, 1977, contained the following paragraph:

... it is proposed that a Project Management Group be formed reporting directly to the manager of the Public Improvement Department. This group would be formed by transferring personnel and units now performing similar functions in each of the bureaus or units to be consolidated. The Project Management Group would be assigned responsibility for work program formation, scheduling, project status reporting, determination of long term and short term workload requirements, and preparation of the annual personnel budget request supported by the approved public improvement program and other workload. It will provide project status information and assistance to the Public Improvements head to fulfill the interdepartmental and interbureau responsibility for physical plant project execution, expediting and control, and to assure that all concerned departments, bureaus and agencies are responsive to the manager's decisions to expedite project completion.

This proposal was not implemented. The concept is sound and again recommended with only slight modification.

Recommendation

That the Board of Public Works, as a logical extension of the recently formed project control unit, instruct the City Engineer to establish a project management division to be initially staffed from existing personnel resources, and assign to the division authority and responsibilities as outlined in this Report.

B. Project Cost Accounting

Issue

The cost accounting for engineering projects is not adequate for effective project control.

Discussion

The present system for recording project costs is not adequate to provide effective project control. Ideally, a cost accounting system would provide a means to monitor costs on a continuous basis, to compare expenditures to budget projections, to identify points where costs vary significantly from expectations, to provide a basis for predicting impacts on project development, and finally, to provide a basis for project adjustment, reorientation and evaluation. Under the existing system, costs are accumulated from project origination through project closure, but no ongoing examination is made of the relationship of costs to budget.

Cost accounting should be utilized with workload analysis as a means of reviewing costs during the project development to determine if a project is on schedule and if cost charges are consistent with project implementation expectations. As a project develops and it becomes apparent costs will exceed original expectations, the Bureau would be in the position to make recommendations as to the feasibility of continuing the project, the desirability of scaling the project down to a more manageable size, or to provide additional funding for continued development.

Without such a system, the City each year must appropriate an additional amount of money to the General Fund from the Special Gas Tax Street Improvement Fund (the Fee Report) to provide for the additional design costs incurred for projects which are not now being monitored for cost effectiveness. In the last four years, adjustments of this type approved for the Bureau of Engineering have totaled \$9,527,581. For the most part, these adjustments are made without effective cost accounting to predict trends and form a basis for making an informed judgment as to whether the additional expenditure is appropriate.

The cost accounting system envisioned here should, at the very least, have the following elements:

1. It should be timely so that costs are accumulated and presented to Bureau management shortly after the close of a reporting period.
2. Costs should be accumulated so that they can be compared against a budgeted amount for the project and the program year.

With a more comprehensive cost accounting system similar to the one described here, Bureau management would be in a position to review project costs on an ongoing basis and make judgements as to their appropriateness and whether additional expenditures should be approved. It should be noted in this context that recent Bureau efforts to establish a cost accounting system to meet requirements imposed by the Clean Water Act grant program do not constitute a comprehensive, long-term response to this deficiency within the context of the City's long range integrated financial management system.

Recommendation

That the Board of Public Works instruct the City Engineer and the Chief Accountant, Bureau of Accounting, to take action as required to make the Cost Accounting System compatible with the Project Status Report and History of Projects File so that:

- a. Design costs and other Bureau costs can be retained for each project.
- b. Project design-cost-to-construction-cost ratios can be further developed for the different project types to provide a better basis for establishing resource requirements for future projects. These resource requirements would use historically established design-cost-to-construction-cost ratios and other professionally accepted indices to predict the requirements for new projects.
- c. Continuous financial monitoring of each project can be maintained to identify emerging problems, and provide insights into the development of projects purely from a cost perspective so that cost overruns are avoided.

VI. Contracting for Services

During the 1980-81 fiscal year the Bureau of Engineering contracted with the private sector for work worth slightly more than \$2.6 million. This amount basically consisted of fees for services and not project construction. The bulk of the funds expended were related to the Wastewater Systems Engineering Division for assistance and special expertise on the variety of wastewater projects currently being either designed or constructed. Funds were also spent to hire consultants to assist in litigation pertaining to the Terminal Island Treatment Plant. Relatively small sums were spent for aerial surveying, index conversion, environmental impact reports and private sector real estate appraisals. No money was spent on routine capital improvement design for physical plant projects or for surveying work.

The Bureau has planned to spend up to \$7 million in the 1981-82 fiscal year for private design and consulting work with the major portion being spent for the Hyperion Energy Recovery System, Terminal Island Treatment Plant, and the Sepulveda Water Reclamation Plant. The two main reasons for contracting with the private sector for these services appear to be the specialized expertise of the contractors and the nonavailability of Bureau personnel. Management of the Bureau has expressed satisfaction with this effort.

As stated in other sections of this Report, the Bureau has experienced a steady decline in its workforce since 1969-70. Bureau-wide, the reduction exceeds 25 percent. Particularly hard hit have been the Street Improvement, Street Maintenance, and Assessment-Financed Improvement programs. These programs have absorbed higher than average reductions due to a combination of factors, including the urgency and importance of other Bureau programs, such as Wastewater Facilities and Privately-Financed Improvements, declining workload, and programs with separate funding sources. These reductions have created significant problems for the Bureau in the areas of morale, recruitment, and retention of highly qualified and motivated engineers.

Another significant problem has been the up and down nature of the Capital Improvement Expenditure Program. In 1974-75 the Program totalled \$27 million; the following year the total was \$12 million. These fluctuations are a result of the budgetary problems that have beset the City during the last few years. Notwithstanding the City's financial constraints, the Bureau has been negatively impacted by the decreased priority

assigned to the need for physical improvements to the City. Planning the work of the Bureau has been made even more difficult due to the fluctuations in the Program and the uncertainty of the Bureau's future staffing levels. This dilemma does not appear to be readily solvable under the Bureau's current mode of operations. However, there is an alternative which appears worthy of serious consideration based upon our analysis of similar activities in other local governments. The approach would involve implementation by the Bureau of the project management concept and consolidation of the design effort in the Central office as recommended earlier in this Report. The Bureau could then address the Five-Year Capital Program in a different manner. The first year of the Program would become the critical workload determinant, both from a financial and a design standpoint. Bureau management would determine which tasks, included in the Program, could be completed in the ensuing fiscal year based upon the staff available. The remaining projects above that level would be contracted to the private sector for design or real estate appraisal, or whatever activity is necessary to insure that the scheduled tasks are completed in a timely fashion.

A. Physical Plant Design Services

Issue

The Bureau of Engineering traditionally has only rarely contracted for design of capital improvement (physical plant) projects, and the possibility of contracting for such services has received minimal consideration as a viable option.

Discussion

With the fluctuations in the funding of the Five-Year Capital Program the Bureau has had difficulty in staffing for the amount of work scheduled to be accomplished. For example, in any one year the Bureau may not have enough resources assigned to design street improvement projects. Those projects that are not completed are merely added to an undefined "backlog". In other years when the financing of the Program is reduced, the Bureau may then reduce the backlog of previously financed but uncompleted projects. This has the dual effect of both extending the time required to accomplish most projects, and hampering efforts to get an accurate picture of Bureau workload.

The inconsistencies in funding and workload create other problems for the Bureau aside from workload. These problems include reduced morale of employees, and a diminished capability to retain and recruit good employees. The Bureau should try to develop a reduced core staff of employees to

perform the majority of the work assigned. As a first step the Bureau should analyze the present workload and develop a schedule for completion. The schedule should become both an internal and external control document so that changes in the Bureau workforce can be accurately analyzed by all parties and the impact of reductions or additions to either the workforce or the program can be measured. Once the Bureau decides the amount of work it can accomplish during the next fiscal year, funds can be provided to contract for the remaining work. By setting the Bureau workforce at a level below the amount of work scheduled, the Bureau should be able to retain a fairly stable number of positions. Work beyond the level to be accomplished by the Bureau would be contracted out. Thereafter, changes in the workload of the Bureau would directly impact the amount of contract work to be accomplished in the fiscal year. By implementation of this system projects would be completed under a more reasonable schedule. The Bureau's performance could be more accurately gauged and the morale of Bureau employees should improve since their future would not be so much in doubt.

On June 23, 1982, the City Council adopted the concept of using private engineering firms to design selected capital improvement projects. This action is consistent with recommendations contained herein and should accelerate the Bureau's implementation of this concept.

Recommendation

That Bureau management determine the number of engineering positions required to establish a staff nucleus for Bureau design operations. This staffing base should be fixed at a level below that which can be specifically justified by the annual workload, with the balance and any additional work to be accomplished utilizing private contractors. (Note: The differential between the base staffing level and the level justified by actual workload should be determined by Bureau management, considering as a significant variable the low end of an estimated range of funding for physical plant improvements.)

B. Construction Survey Services

Issue

The Bureau of Engineering normally provides construction survey crews to private contractors performing City capital improvement work. This practice results in high overtime costs, scheduling problems, and City assumption of part of the contractor's liability.

Discussion

The Bureau of Engineering is one of few public agencies in California to provide construction surveying for work done by private construction contractors for the City. The Bureau advises that by doing this the City receives not only lower construction bids but also better quality control on these projects. To determine the savings achieved by the City in providing these survey crews on construction projects is difficult at best. Many elements in the bidding procedure impact on the number and size of bids. Some of these elements include the level of activity within the construction industry and the availability of a labor pool and/or subcontractors. What is known is that the City experiences continual problems with scheduling of crews and overtime costs due to City holidays and workshifts being different from those observed by private contractors. If the private contractor observes a holiday that the City does not, the survey crew assigned to that project is given a "make work" assignment for the day. Conversely, if the City observes a holiday that the contractor does not, the City crew must be paid overtime so as not to delay the contractor's work. Inclement weather also creates additional costs, with City crews idle but still being paid.

Another issue of concern created by the City's current policy toward construction surveying is the amount of liability that the City assumes by providing this service. It may be reasoned that a contractor's defense for errors discovered on a project could be that the City was responsible through errors made by the City's survey crew. On a project in which a contractor has to provide all services, including surveying, that particular defense is not applicable.

The quality of the City's survey work is very high. The cost of that quality also is extremely high. Under normal budgetary circumstances, it is unlikely that this matter would surface as an Audit issue. However, the financial reality is such that the City must consider reductions in service when analysis shows there is an even greater potential for cost savings.

The Bureau should conduct a pilot study of offering for bid a selected number of street improvement projects without City crews doing the on-site construction surveying. The results of the study could then be evaluated to determine the feasibility of City survey crews no longer doing the construction surveying of street improvements projects.

Recommendation

That the Board of Public Works instruct the City Engineer to:

- a. Conduct a pilot study based on requiring private contractors to provide their own construction surveying on selected projects.
- b. Analyze the results of the pilot study and transmit appropriate findings and recommendations to the Board for consideration.

C. Construction Management

Issue

Major design and construction projects, such as wastewater treatment projects, make inordinate demands on the Bureau in terms of technical expertise and personnel resources.

Discussion

In the past several years and at the present time, the Bureau has undertaken several major wastewater treatment projects: the Glendale Water Treatment Plant, modification to the Terminal Island Treatment Plant, the Sepulveda Water Treatment Plant, and the Hyperion Energy Recovery System (HERS). While some of the design work was done in-house on these projects, contractual assistance has been used both for design services and to assist in monitoring construction. Serious problems have occurred on some of the projects. Each of these projects has required the assignment of large numbers of personnel and the close attention of management, and has taken many years to complete.

In a period of declining projects and stringent financial limitations, the Bureau cannot afford to maintain staff sufficient to accomplish the design of all major projects. As indicated above, the Bureau has employed consultants when there is a need for nonresident expertise or when dictated by personnel unavailability. The Bureau should continue to use consultants extensively for design and related services to avoid inordinate increases in design staff for any one project or program. Where appropriate, "turnkey" type contracts (design and construction by the same contractor) should be used.

Recommendation

That the Board of Public Works instruct the City Engineer to exercise his option to selectively request bids for the complete design and construction of future major projects, consistent with specific definition and criteria to be developed cooperatively with the respective operating agencies

(departments) of City government. Where appropriate, "turnkey" type contracts (design and construction by the same contractor) should be used. Any staff freed as a result of this recommendation should be reassigned and their vacated positions eliminated.

VII. Engineering Manuals

Issue

The Bureau has not completed the set of ten engineering manuals as originally planned. The manuals that have been completed and published have not been systematically updated. Accordingly, the usefulness of the manuals as a working tool has been minimal.

Discussion

Over 20 years ago, the Bureau embarked on a program which called for the preparation and revision on a current basis of a series of manuals to cover certain designated areas of its operations. Manuals were to be prepared in ten parts or volumes. To date less than six of the original ten parts have been completed and published, and they have not been systematically revised.

During the course of the Audit, we solicited opinions from experienced personnel as to whether the time and effort involved in manual preparation has been cost-beneficial. The opinions expressed varied. Generally, the three basic design manuals which were originally published over ten years ago were supported as being useful and cost beneficial. However, there was recognition that in recent years the usefulness may have diminished because the manuals have not been kept current. The other procedural type manuals were believed to be somewhat less useful.

In general, we found the existing published manuals to be very detailed and voluminous. It may be that the manual preparation and revision effort "bogged down" because an attempt was made to write the manual with too much explanatory detail in contrast to limiting its contents to technical definitions, essential data and procedural requirements with minimal explanation. If it is assumed that the manuals will be used by career engineers, the latter more limited approach as to detail and content may be more appropriate.

One of the procedural manuals which has not been completed even in draft form is designated Part D, Subdivisions and Dedications. Opinion of experienced personnel again varied. However, this Office shares the opinion that an up-to-date manual on Subdivisions and Dedications would be particularly useful and cost beneficial, and should be prepared and systematically updated. The technical and procedural requirements imposed on developers and private engineers are

detailed and complex. These requirements are subject to change as State and local laws are adopted and amended, and changes occur in technical administrative procedures. A Subdivision and Dedications Manual, which provides a means for revision by inserts as required, could be sold to private engineers and developers. This would eliminate much explanation that must now be done in person or over the telephone. It would also provide: a formal recordation of many detailed practices and procedures which are now communicated orally; a basis for uniformity in application throughout the Bureau; a training manual for personnel newly assigned to private development; and a reference manual for those engineers who are not assigned to private development.

Recommendation

That Bureau Management:

- a. Reevaluate the magnitude, scope and content of the Bureau of Engineering manuals as originally planned, and develop a revised plan for their timely completion, and for procedures to systematically update the manuals on a current basis.
- b. Assign one or more staff members with a detailed working knowledge of the private development process to work full-time to complete the Part D, Subdivisions and Dedications Manual.

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